Journal of Research on the Lepidoptera 3 (3) :148-150, 1964

1140 W. Orange Grove Ave., Arcadia, California, U.S.A.

INSTAR DETERMINATION OF *AGATHYMUS* LARVAE

KILIAN ROEVER

3739 W. Townley Ave., Phoenix, Arizona

To DETERMINE THE NUMBER of instars or a specific instar can be difficult, particularly when ecdysis is not readily observed as is the case with *Agathymus* larvae. An attempt to solve the problem of instar determination of *Agathymus* larvae was made through the application of Dyar's "law". Dyar (1890) made two generalizations: the sclerotized parts of larvae do not change in area during an instar, the increase in these parts during larval development occurring only at ecdysis; the discontinuous increase in the dimensions of sclerotized parts during larval development usually takes the form of a geometrical progression (Dyar's law). It would therefore follow that instars can be characterized by the measurements of sclerotized areas of any individual if the range of variation for each instar is known and does not overlap the dimensions of other instars. Also, if measurements can be made of two successive instars of an individual a geometrical progression could be found which would be useful in predicting the measurements to be expected of the other instars.

To test these hypotheses measurements were made of larvae from several Agathymus populations (Table 1). I selected the width of the head capsule at the widest point as the sclerotized part to measure. This was done under a dissecting microscope containing ocular grids calibrated with a stage micrometer. All measurements were rounded to the nearest 1/50 mm in the case of the first and second instars; to the nearest 1/10 mm for the remaining instars. The larvae were killed and fixed for a period not exceeding 30 minutes in a modification of Peterson's K.A.A.D. mixture (Atkins, 1958), then stored in 95% ethyl alcohol. The only measurements discarded were of those larvae which had recently moulted as shown by soft, untanned sclerotized areas. Larval fixation caused distortion to those unhardened areas.

The graphs (Fig. 1) show the measurements obtained

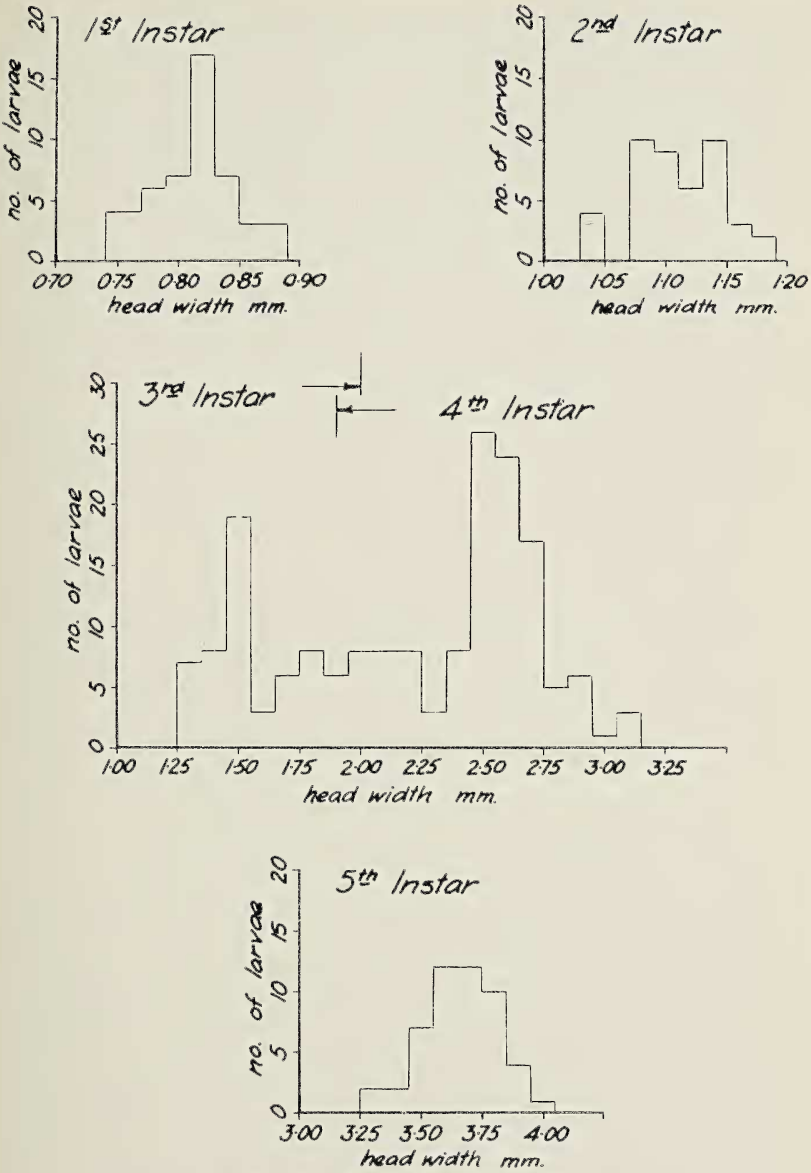

Figure 1. Histograms illustrating head width variation of Agathymus larvae at various instars

from an *Agathymus aryxna* population in the Santa Catalina Mountains which was sampled bi-monthly from November until June. The distribution curves for the first, second, and fifth instar larvae are clear-cut because they do not overlap the measurements of the other instars. The distribution curves of the third and fourth instars do overlap. This overlap was substantiated by a comparison between fourth instar larvae which had recently moulted and the head capsules of the preceding instar which remained in the burrows. A similar overlap was detected in smaller samples of *Agathymus polingi* and *A. baueri.* The possibility exists that a variation in the number of instars may occur in a given population, a condition which has been demonstrated to occur in some Lepidoptera.

Instar determination within the range of overlap can not be made solely on the basis of head width measurements. Furthermore, the progressions derived from the measurements of successive instars are not satisfactory in predicting the approximate head width of the other instars.

The comparison of the larvae of *A. aryxna, A. baueri, A. polingi,* and *A. neumoegeni* in all instars provided a combination of characters which generally proved successful for instar determination without establishing the range of variation in the sclerotized areas of the larvae in each population. A key to the instars is as follows:

1. Parietals dark brown or black; concolorous ..... 2.
1′. Parietals uniformly light or patterned with dark brown markings on a light background ..... 4.

2. Only primary setae present; setae few in number and and borne on conspicious tubercules .....First Instar
2′. Secondary as well as primary setae present ..... 3.

3. Primary setae clearly longer than the secondary setae .....Second Instar
3′. Primary setae not readily distinguishable in length from the secondary setae; all setae short .....Third Instar

4. Parietals not concolorous; pattern of dark brown markings on a light brown background .....Fourth Instar
4′. Parietals concolorous; light brown .....Fifth Instar

REFERENCES

ATKINS, E. L., JR., 1958. Killings and fixing lepidopterous larvae with a modifid K.A.A.D. mixture. *J. Econ. Entomol.* 51 (5): 740.

DYAR, H. G., 1890. The number of molts of lepidopterous larvae. *Psyche* 5: 420-422.